Combined Heat & Power at the University of Minnesota

October 23, 2013

division of energy resources
Minnesota Department of Commerce

with

UNIVERSITY OF MINNESOTA

Guiding Principals:

Energy Management's decisions are driven by:

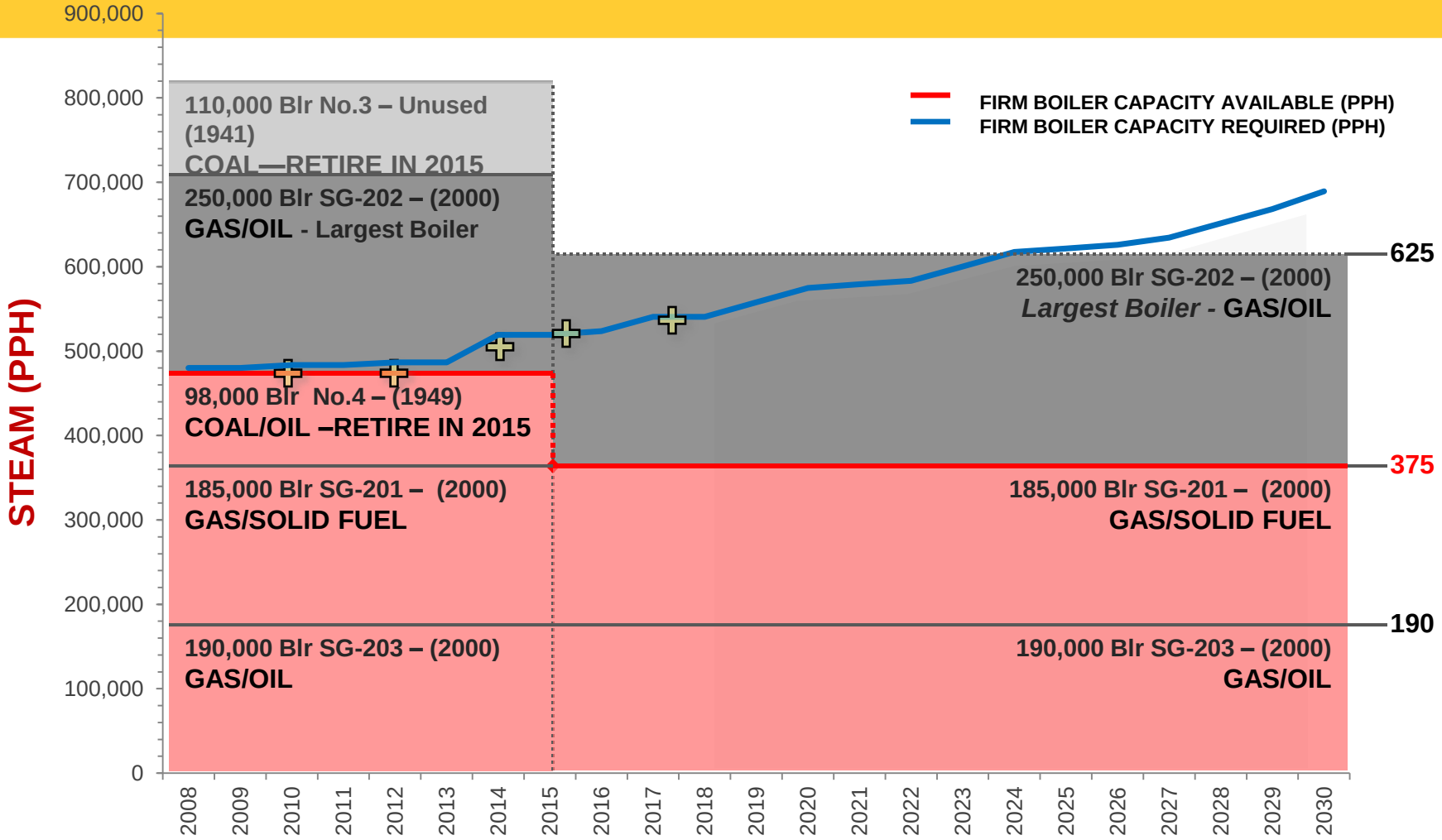
- **Reliability**
- **Sustainability**
- **Cost Effective**

Master Planning:

Pathway to Combined Heat and Power Proposal

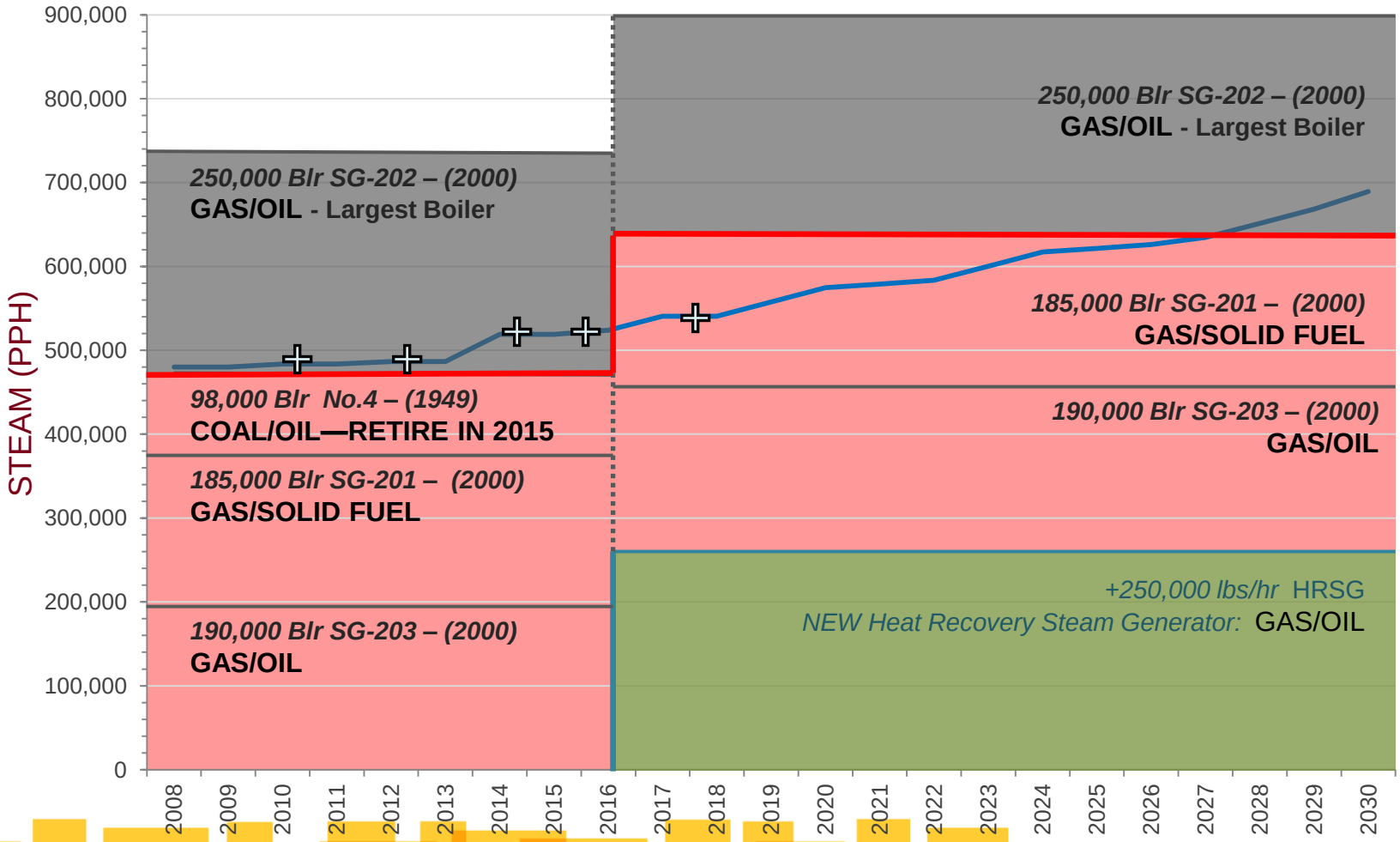
- **Utility Master Plan identified need for new steam capacity due to obsolete 1940's boilers and significant campus growth**
- **Traditional boiler used for the baseline assumption**

Reliability > N+1



Major New Buildings

Reliability > N+1



✛ Major New Buildings

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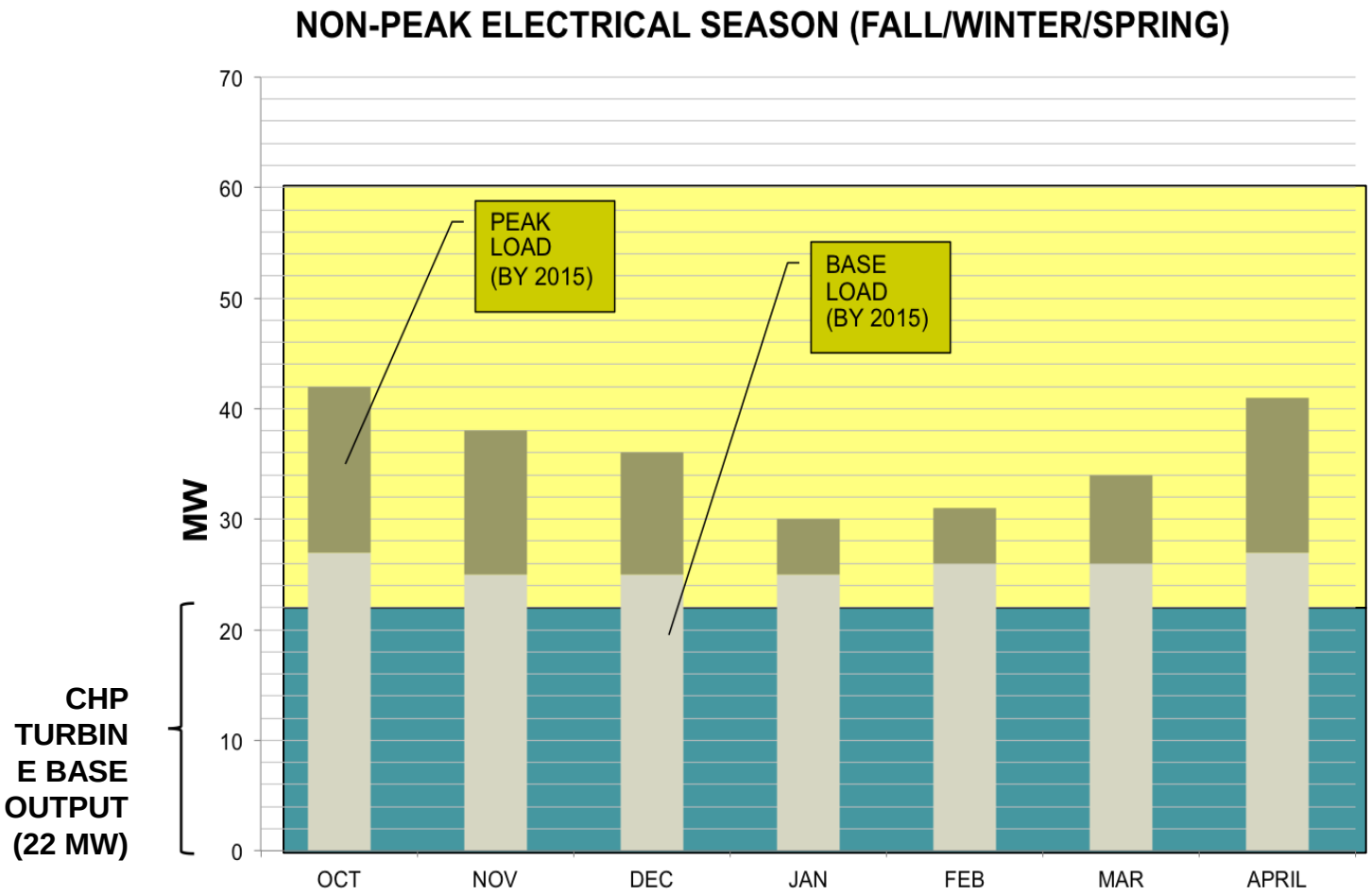
Energy Management

Master Planning:

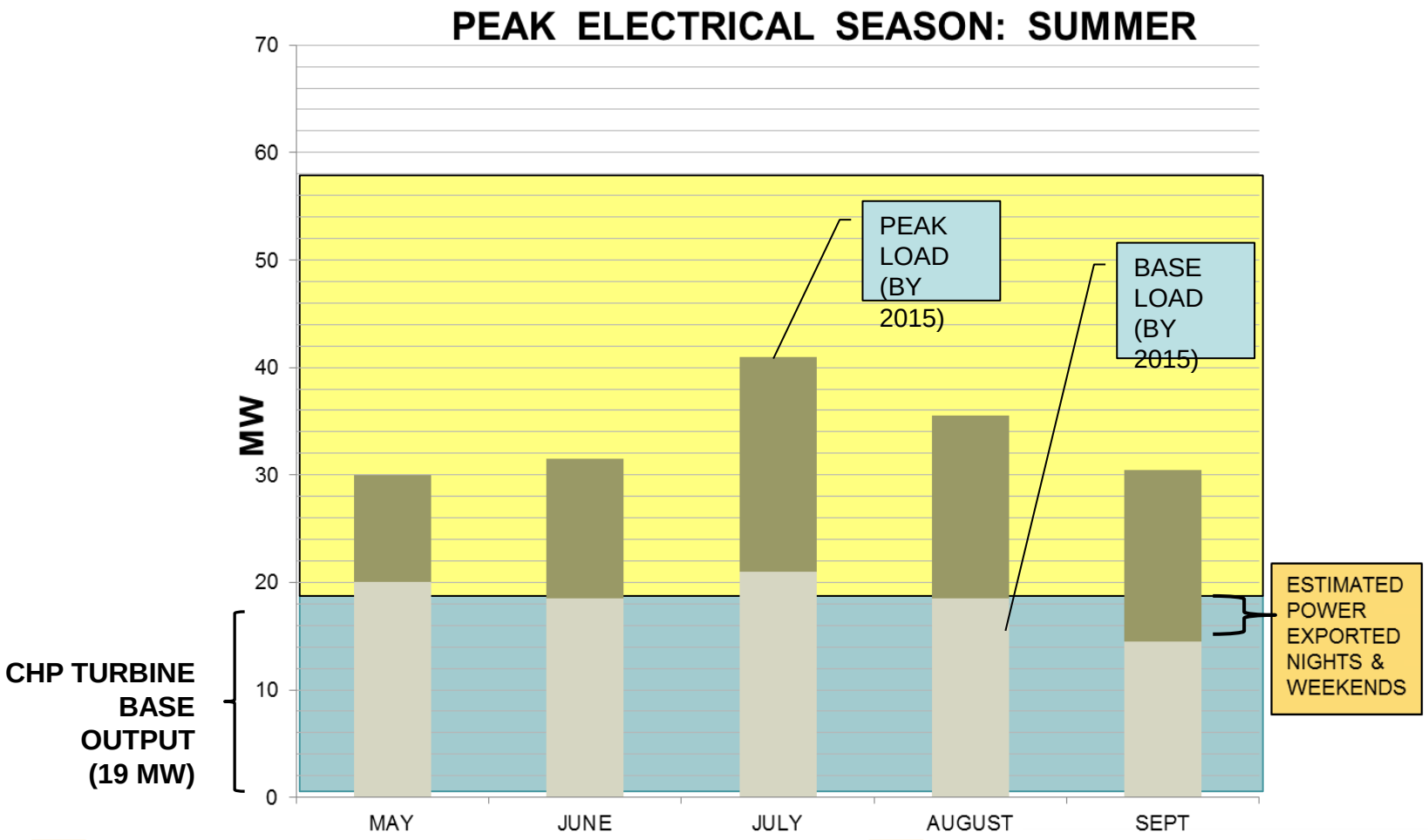
Pathway to Combined Heat and Power Proposal

- **25MW Turbine recommended:**
  - **Creates more reliable electrical service to campus**
  - **Lowers Twin Cities Campus Carbon Footprint by 15%**
  - **Provides annual and life cycle cost savings**

Match Your Loads:



Match Your Loads:



Sustainable: Climate Action Plan

Climate Action Plan Evaluation Criteria

- Annual reduction in greenhouse gas emissions
- Cost of implementation
- Operating cost or savings
- Net present value cost or savings
- Useful life
- Synergy with U mission and priorities
- Visibility
- Cost/Savings Per Unit of Emissions Reduced

Sustainable: Climate Action Plan

Strategy	Annual CO2 Reduction (metric tons)	Cost Per Metric Ton Reduced
Reduce campus 1 M GSF	22,000	($75.11)
Build CHP	68,300	($25.78) *
Reduce lab air exchanges	43,106	($21.28)
Recommission Buildings	59,001	($20.88)
Buy wind credits	2,988	$ 2.41

Cost – Marginal Investment Pays

	Traditional Boiler	One - 25 MW Turbine
First Cost	$ 58M	$ 96M
Annual Cost/ (Savings) vs. FY14	$ 3M Cost	$ (2M Savings)
Annual Savings vs. Boiler Only	$ 0	$ (5M Savings) 8 year return on the marginal investment
30 yr Lifecycle (Savings)	$ 0	$176M

Considerations:

- Thermal balance is absolutely required for acceptable economics.
- Right size for the project
- Delivery of power and heat needs careful consideration
- Permits – Pay attention!
- Contracts
- Training

An In Conclusion…